

CLAIMS

1. A high damage tolerant Al-Cu 2xxx-series alloy rolled product having a high toughness and an improved fatigue crack growth resistance, comprising the following composition (in weight percent):

Cu: 3.8 - 4.7

Mg: 1.0 - 1.6

Zr: 0.06 - 0.18

Mn: >0 - 0.50

Cr < 0.15

Fe: \leq 0.15

Si: \leq 0.15,

the balance essentially aluminum and incidental elements and impurities, wherein the alloy product comprises Mn-containing dispersoids and Zr-containing dispersoids, and wherein the alloy product is in a T3 temper.

2. Alloy product according to claim 1, wherein the product is provided in T39 or T351 temper condition.

3. Alloy product according to claim 1, wherein said alloy product is recrystallized to at least 75%.

4. Alloy product according to claim 1, wherein said alloy product is recrystallized to at least 80%.

5. Alloy product according to claim 1, wherein the amount (in weight %) of Mn is in a range of >0.15 to 0.50%.

6. Alloy product according to claim 1, wherein the amount (in weight %) of Mn is in a range of 0.20 to 0.45%.

7. Alloy product according to claim 1, wherein the amount (in weight %) of Mn is in a range of 0.25 to 0.30%.
8. Alloy product according to claim 1, wherein the amount (in weight %) of Cu is in a range of 4.0 to 4.7%.
9. Alloy product according to claim 1, wherein the amount (in weight %) of Cu is in a range of 4.0 to 4.4%.
10. Alloy product according to claim 1, wherein the amount (in weight %) of Cu is in a range of 4.1 to 4.3%.
11. Alloy product according to claim 1, wherein the amount (in weight %) of Mg is in a range of 1.0 to 1.4%.
12. Alloy product according to claim 1, wherein the amount (in weight %) of Mg is in a range of 1.1 to 1.3%.
13. Alloy product according to claim 1, wherein the amount (in weight %) of Fe is in a range of $\leq 0.10\%$.
14. Alloy product according to claim 1, wherein the amount (in weight %) of Si is in a range of $\leq 0.10\%$.
15. Alloy product according to claim 1, wherein the amount (in weight %) of Zr is in a range of 0.09 to 0.15%.
16. Alloy product according to claim 1, wherein the amount (in weight %) of Cr is in a range of 0.05 to 0.15%.
17. Alloy product according to claim 1, wherein the sum (in weight %) of Zr+Cr is in

a range of $< 0.20\%$.

18. Alloy product according to claim 1, wherein the sum (in weight %) of Zr+Cr is in a range of 0.10 to 0.13%.

19. Alloy product according to claim 1, wherein the alloy product is substantially Ag-free.

20. Alloy product according to claim 1, wherein said alloy further comprises one or more of the elements Zn, Hf, V, Sc, Ti or Li, the total amount less than 1.00 (in weight %).

21. Alloy product according to claim 1, having a microstructure wherein the grains have an average length to width aspect ratio of smaller than about 4 to 1.

22. Alloy product according to claim 21, having a microstructure wherein the grains have an average length to width aspect ratio of smaller than about 3 to 1.

23. Alloy product according to claim 21, having a microstructure wherein the grains have an average length to width aspect ratio of smaller than about 2 to 1.

24. Alloy product according to claim 1, wherein the alloy product has a fatigue crack growth rate of less than 0.001 mm/cycles at $\Delta K=20 \text{ MPa}\sqrt{\text{m}}$ when tested according to ASTM-E647 on 80 mm wide M(T) panels at $R=0.1$ at constant load and at a frequency of 8 Hz.

25. Alloy product according to claim 24, wherein the alloy product has a fatigue crack growth rate of less than 0.01 mm/cycles at $\Delta K=40 \text{ MPa}\sqrt{\text{m}}$ when tested according to ASTM-E647 on 80 mm wide M(T) panels at $R=0.1$ at constant load and at a frequency of 8 Hz.

26. Alloy product according to claim 1, wherein the alloy product has been manufactured by a process comprising the steps of casting, hot rolling, optionally cold rolling, solution heat treating, quenching the solution heat treated product, stretching the quenched product, naturally ageing to product to achieve a T3 temper condition.

27. Alloy product according to claim 1, wherein the alloy product has a thickness of in a range of 2.0 to 12 mm.

28. Alloy product according to claim 1, wherein the alloy product has a thickness of in a range of 25 to 50 mm.

29. Alloy product according to claim 1, wherein the alloy product is processed into a fuselage sheet of an aircraft.

30. Alloy product according to claim 1, wherein the alloy product is processed into a lower-wing member of an aircraft.

31. Alloy product according to claim 1 consisting of, in weight %:

Cu	3.8 - 4.7
Mg	1.0 - 1.6
Zr	0.06 - 0.18
Mn	>0.15 - 0.50
Cr	< 0.15
Fe	≤ 0.15
Si	≤ 0.15,

the balance essentially aluminum and incidental elements and impurities.

32. A method for producing a rolled high damage tolerant AA2xxx-series alloy product according to claim 1 and having a high toughness and an improved fatigue crack growth resistance, comprising the steps of:

a) casting an ingot with comprising the following composition (in weight percent):

Cu: 3.8 - 4.7

Mg: 1.0 - 1.6

Zr: 0.06 - 0.18

Mn: >0 - 0.50

Cr < 0.15

Fe: \leq 0.15

Si: \leq 0.15,

the balance essentially aluminum and incidental elements and impurities,

b) homogenizing and/or pre-heating the ingot after casting,

c) hot rolling the ingot and optionally cold rolling into a rolled product,

d) solution heat treating,

e) quenching the heat treated product,

f) stretching in the quenched product, and

g) naturally ageing the rolled and heat-treated product to provide a T3 condition;
and wherein the alloy product comprises Mn-containing dispersoids and Zr-containing dispersoids.

33. Method according to claim 32 wherein the alloy product is processed to provide a T39 or T351 temper condition.

34. Method according to claim 32, wherein after hot rolling the ingot, annealing and/or reheating the hot rolled ingot and again hot rolling the rolled ingot.

35. Method according to claim 32, wherein said hot rolled ingot is inter-annealed before and/or during cold rolling.

36. Method according to claim 32, wherein said rolled and heat-treated product is stretched by about 1 to 5 % and naturally aged for more than 5 days.

37. Method according to claim 36, wherein said rolled and heat-treated product is stretched by about 1 to 5 % and naturally aged for more than 10 days.